

WHAT IS CLAIMED IS:

- 1 1. A system for treating exhaust gases from an internal
2 combustion engine, the system comprising:
3 a housing having a first flow path and a second flow path for
4 transporting the exhaust gases from the engine, the flow paths having coaxially
5 arranged portions;
6 a gas directing device for selectively directing the exhaust gases
7 between the first flow path and the second flow path;
8 a first NOx adsorbing catalyst contained in the first flow path, the
9 first NOx adsorbing catalyst requiring periodic regeneration to purge accumulated
10 NOx; and
11 a first reductant supply source capable of selectively directing a gas
12 containing a reducing agent to flow into the first NOx adsorbing catalyst.
- 1 2. The system of claim 1 wherein the second flow path has a
2 portion that bypasses and is coaxial with the first NOx adsorbing catalyst.
- 1 3. The system of claim 2 wherein the portion of the secondary
2 flow path that is coaxial with the first NOx adsorbing catalyst is spaced axially
3 outward from the main flow path.
- 1 4. The system of claim 2 further comprising:
2 a diesel oxidation catalyst for oxidizing gases from the first and
3 second flow paths, the diesel oxidation catalyst being downstream from the first
4 NOx adsorbing catalyst.
- 1 5. The system of claim 4 wherein the housing contains a chamber
2 upstream of the diesel oxidation catalyst and downstream of the first NOx adsorbing
3 catalyst wherein the first and second flow paths are capable of flowing into the
4 chamber, the chamber being in fluid communication with the diesel oxidation
5 catalyst.

1 6. The system of claim 1 further comprising:
2 a first catalyzed diesel particulate filter contained in the first flow path
3 upstream of the first NOx adsorbing catalyst.

1 7. The system of claim 1 further comprising:
2 a control system including sensors in communication with control
3 logic, the control system operative to determine timing of the periodic regeneration
4 of the first NOx adsorbing catalyst.

1 8. The system of claim 7 wherein the control system is further
2 operative to regenerate the first NOx adsorbing catalyst by controlling the gas
3 directing device to selectively direct at least a substantial portion of the exhaust
4 gases from the engine through the second flow path while controlling the first
5 reductant supply source to selectively direct the gas containing the reducing agent
6 to flow towards the first NOx adsorbing catalyst.

1 9. The system of claim 8 wherein the reducing agent comprises
2 hydrocarbons used as fuel for the internal combustion engine.

1 10. The system of claim 1 further comprising:
2 a second NOx adsorbing catalyst contained in the second flow path,
3 the second NOx adsorbing catalyst requiring periodic regeneration to purge
4 accumulated NOx.

1 11. The system of claim 10 further comprising:
2 a first catalyzed diesel particulate filter contained in the first flow path
3 upstream of the first NOx adsorbing catalyst wherein the second flow path has a
4 portion that bypasses and is coaxial with the first catalyzed diesel particulate filter
5 and the first NOx adsorbing catalyst; and
6 a second catalyzed diesel particulate filter contained in the second
7 flow path upstream of the second NOx adsorbing catalyst wherein the first flow path
8 has a portion that bypasses and is coaxial with the second catalyzed diesel particulate
9 filter and the second NOx adsorbing catalyst.

1 12. The system of claim 11 wherein the coaxial portions of the
2 first and second flow paths have inner and outer flow path portions wherein the
3 inner flow path portion of the first flow path is capable of directing gases through
4 the first NOx adsorbing catalyst and the outer flow path portion of the first flow
5 path is capable of directing gases to bypass around the first NOx adsorbing catalyst.

1 13. The system of claim 12 wherein the housing has an
2 interchange portion between coaxially arranged portions of the first and second flow
3 paths wherein the first and second flow paths change relative position.

1 14. The system of claim 13 further comprising:
2 a control system including sensors in communication with control
3 logic, the control system operative to determine timing of the periodic regeneration
4 of the first and second NOx adsorbing catalysts.

1 15. The system of claim 14 wherein the control system is further
2 operative:
3 to regenerate the first NOx adsorbing catalyst by controlling the gas
4 directing device to selectively direct at least a substantial portion of the exhaust
5 gases through the second flow path while controlling the first reductant supply
6 source to selectively direct the gas containing the reducing agent to flow towards the
7 first NOx adsorbing catalyst; and
8 to regenerate the second NOx adsorbing catalyst by controlling the
9 gas directing device to selectively direct at least a substantial portion of the exhaust
10 gases to the first flow path while controlling the second reductant supply source to
11 selectively direct the gas containing the reducing agent to flow towards the second
12 NOx adsorbing catalyst.

1 16. The system of claim 15 wherein the first and second flow
2 paths merge upstream of the diesel oxidation catalyst and are capable of directing
3 flow through the diesel oxidation catalyst.

1 17. The system of claim 1, further comprising:
2 a second NOx adsorbing catalyst contained in the second flow path,
3 the second NOx adsorbing catalyst requiring periodic regeneration to purge
4 accumulated NOx, wherein the second NOx catalyst is downstream from and in the
5 same general plane as the first NOx adsorbing catalyst.

1 18. The system of claim 17 further comprising:
2 a first catalyzed diesel particulate filter contained in the first flow path
3 upstream of the first NOx adsorbing catalyst wherein the second flow path has a
4 portion that bypasses and is coaxial with the first catalyzed diesel particulate filter
5 and the first NOx adsorbing catalyst; and
6 a second catalyzed diesel particulate filter contained in the second
7 flow path upstream of the second NOx adsorbing catalyst wherein the first flow path
8 has a portion that bypasses and is coaxial with, and axially outward relative to, the
9 second catalyzed diesel particulate filter and the second NOx adsorbing catalyst.

1 19. A method for treating exhaust gases from an internal
2 combustion engine, the method comprising:
3 transporting the exhaust gases from the engine to a housing that
4 contains a first flow path and a second flow path, the flow paths having coaxially
5 arranged portions;
6 selectively directing the exhaust gases between the first flow path and
7 the second flow path;
8 providing a first NOx adsorbing catalyst contained in the first flow
9 path, the first NOx adsorbing catalyst requiring periodic regeneration to purge
10 accumulated NOx; and
11 selectively directing a gas containing a reducing agent to flow into the
12 first NOx adsorbing catalyst to periodically regenerate the catalyst.

1 20. The method of claim 19 further comprising:
2 regenerating the first NOx adsorbing catalyst by selectively directing
3 at least a substantial portion of the exhaust gases from the engine towards the second

4 flow path while selectively directing the gas containing the reducing agent to flow
5 through the primary NOx adsorbing catalyst.

1 21. A method for treating exhaust gases from an internal
2 combustion engine, the method comprising:

3 providing a housing that has a first and second flow conduit in a
4 coaxial arrangement, the first flow conduit being axially inward of the second flow
5 conduit;

6 providing a first NOx adsorbing catalyst in the first flow conduit, the
7 first NOx adsorbing catalyst requiring periodic regeneration to purge accumulated
8 NOx;

9 selectively directing the exhaust gases through the first and second
10 flow conduits; and

11 when directing gases through the second flow conduit, selectively
12 directing a gas containing a reducing agent to flow through the first NOx adsorbing
13 catalyst.

1 22. An apparatus for treating exhaust gases from an internal
2 combustion engine, the apparatus comprising:

3 a housing having a first flow path and a second flow path for
4 transporting the exhaust gases from the engine, the flow paths having coaxially
5 arranged portions;

6 a gas directing device for selectively directing the exhaust gases
7 between the first flow path and the second flow path; and

8 a first NOx adsorbing catalyst contained in the first flow path, the
9 first NOx adsorbing catalyst requiring periodic regeneration to purge accumulated
10 NOx.

1 23. The apparatus of claim 22 further comprising:

2 a first catalyzed diesel particulate filter contained in the first flow path
3 upstream of the first NOx adsorbing catalyst.

1 24. The apparatus of claim 23 wherein the second flow path has
2 a portion that bypasses and is coaxial with the first catalyzed diesel particulate filter
3 and the first NOx adsorbing catalyst.

1 25. The apparatus of claim 24 wherein the portion of the second
2 flow path that is coaxial with the first catalyzed diesel particulate filter and the first
3 NOx adsorbing catalyst is spaced axially outward from the first flow path.

1 26. The apparatus of claim 23 further comprising:
2 a diesel oxidation catalyst in the housing for oxidizing gases from the
3 first and second flow paths.

1 27. The apparatus of claim 26 wherein the diesel oxidation
2 catalyst is downstream from the first NOx adsorbing catalyst.

1 28. The apparatus of claim 26 wherein the housing further
2 comprises a chamber upstream of the diesel oxidation catalyst and downstream of
3 the first NOx adsorbing catalyst, the chamber being in fluid communication with
4 the first and second flow paths and the diesel oxidation catalyst.

1 29. The apparatus of claim 22 further comprising:
2 a second NOx adsorbing catalyst contained in the second flow path,
3 the second NOx adsorbing catalyst requiring periodic regeneration to purge
4 accumulated NOx, wherein the second NOx catalyst is downstream from and in the
5 same general plane as the first NOx adsorbing catalyst.

1 30. The apparatus of claim 29 further comprising:
2 a first catalyzed diesel particulate filter contained in the first flow path
3 upstream of the first NOx adsorbing catalyst wherein the second flow path has a
4 portion that bypasses and is coaxial with the first catalyzed diesel particulate filter
5 and the first NOx adsorbing catalyst; and
6 a second catalyzed diesel particulate filter contained in the second
7 flow path upstream of the second NOx adsorbing catalyst wherein the first flow path

8 has a portion that bypasses and is coaxial with, and axially outward relative to, the
9 second catalyzed diesel particulate filter and the second NOx adsorbing catalyst.

1 31. The apparatus of claim 30 wherein the housing has a first
2 portion, a second portion, and an interchange portion, extending between and
3 connecting the first and second portions, the first flow path having a primary first
4 flow path portion and a secondary first flow path portion, the second flow path
5 having a primary second flow path portion and a secondary second flow path
6 portion, the primary first flow path portion and the primary second flow path
7 portion being located within the first housing portion, with the primary first flow
8 path portion being spaced axially inward of the primary second flow path portion,
9 and the secondary first flow path portion and the secondary second flow path portion
10 being located within the second housing portion, with the secondary first flow path
11 portion being spaced axially outward of the secondary second flow path portion.

1 32. The apparatus of claim 31 wherein the housing comprises an
2 outer wall and a first inner wall and a second inner wall, the inner walls being
3 spaced longitudinally from each other and axially inward from the outer wall, the
4 primary first flow path portion being defined by the first inner wall and the primary
5 second flow path portion being defined by the outer wall and the first inner wall.

1 33. The apparatus of claim 31 wherein the secondary second flow
2 path portion is defined by the second inner wall and the secondary first flow path
3 portion is defined by the outer wall and the second inner wall.

1 34. The apparatus of claim 32 wherein the secondary second flow
2 path portion is defined by the second inner wall and the secondary first flow path
3 portion is defined by the outer wall and the second inner wall.

1 35. The system of claim 34 wherein the first and second flow
2 paths merge upstream of the diesel oxidation catalyst and are capable of directing
3 flow through the diesel oxidation catalyst.